

Agricultural Research Institute, Pusa

One Hundred Notes on Indian Insects

BY

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Imperial Entomologist.



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PREFACE.

THIS Bulletin contains a collection of one hundred short notes on Indian Insects, their names, habits, lifehistories and occurrence either in previously unrecorded localities or on new foodplants. Such notes are commonly made by workers in all branches of entomology but are usually buried away in note-books, reports, and files, or, if published, are so scattered that in any case they become inaccessible to the ordinary student. To obviate this, it is proposed to issue similar notes, collected to form Bulletins, which will be published as material accumulates, and any such notes should be forwarded to me for inclusion in the series. They may deal with habits, lifehistories, foodplants or any other particulars regarding Indian Insects, whilst notes on new crop-pests and on actual trials of control methods are especially required ; but in all cases the insects must be properly identified.

I am indebted to Mr. G. J. Arrow for the identification of the insects mentioned in Notes Nos. 3-25, to Mr. G. A. K. Marshall in Notes 27-30, to Mr. E. Brunetti in Notes 39-60 and to Mr. E. Meyrick for most of those in Notes 74-92.

T. BAINBRIGGE FLETCHER,
Imperial Entomologist.

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One Hundred Notes on Indian Insects.

1. Fauna of a rotten Papaya stem.

IN July 1914 I examined the stem of a dead Papaya (*Papaya carica*) which was standing in my garden at Pusa. The whole interior consisted of a wet mass of rotten pulp which contained numerous dipterous and coleopterous larvae. Amongst the Diptera bred out were long series of *Stomoxys calcitrans* (Muscidae), *Clitellaria heminopla*, W., and *Wallacea argentea* (Stratiomyiidae) and amongst the Coleoptera were *Lasiodactylus* sp. (Nitidulidae), a Histerid, *Belonuchus quadratus* (Staphylinidae), another Staphylinid beetle, and *Monomma brunneum*.

The Tineid moth, *Dasytes rugosella*, has also been bred at Pusa and Coimbatore from Papaya stems, the larva feeding on rotten wood.

2. Formation of new colonies of *Oecophylla smaragdina*.

The nests of *Oecophylla smaragdina* are usually commenced by a single female which lays a batch of eggs on a leaf which is generally more or less curled up or folded over to provide some degree of shelter. When at Myitkyina, in Upper Burma, in August 1914 I found a terminal shoot of *Hibiscus rosasinensis* occupied by an incipient colony composed of eight deilated females and a common mass of eggs and larvae. No males or workers were present, but the leaves were fastened together with silk to a slight extent. The foundation of a new nest by two or more queens acting in common seems to be a very unusual circumstance.

3. *Glycyphana horsfieldi*, Hope. (Arrow, F. I. Ceton., page 121.)

A specimen of this beetle was collected by me at Santikoppa in North Coorg in May 1914 and has been named by Mr. Arrow. The species is not definitely recorded from Southern India in the "Fauna" volume. In this Coorg specimen the golden patches are large, as in the Ceylon form.

4. *Protaetia maculata*, Fab.

A specimen taken by myself at Coimbatore on 18th September 1913 has been returned by Mr. Arrow under this name. In the "Fauna" volume on Cetoniadae this is referred to (pages 143-144) as *aurichalcea*, Fab.

5. *Protaetia terrosa*, G. & P. (Arrow, F. I. Ceton., pages 157-158.)

Two specimens collected in Bellary in September 1913 and identified by Mr. Arrow. This species does not seem to have been recorded previously from Southern India.

6. *Spilophorus cretosus*, Hope. (Arrow, F. I. Ceton., pages 201-202, f. 45.)

A specimen was taken by myself on *Cordia subcordata* at Coimbatore on 8th December 1913, and has been identified by Mr. Arrow, who only records it in his "Fauna" volume from Bengal, Bombay and Ceylon. A second specimen was taken on *cumbu* at Coimbatore on 21st September 1909, and we have it also from Chapra in Bihar.

7. *Eupatorus gracilicornis*, Arrow. (Trans. Ent. Soc. London, 1908, 351; F. I. Ceton., and Dynast., page 270.)

One female in Pusa collection, collected at Masuri on 1st September 1906, has been identified by Mr. Arrow as this species. In the "Fauna" volume it is recorded only from Assam (we have it from the Khasi Hills), Burma, Siam and Tonkin.

8. *Eophileurus planatus*, Arrow. (F. I. Ceton. and Dynast., pages 288-289.)

Five larvæ of this beetle were found at Pusa on 19th May 1915 at the base of a Gular tree (*Ficus glomerata*) in a place where some dead uprooted grass was mixed with the soil. At this time the larvæ were about 35 mm. long, in general appearance like *Oryctes* grubs, the head red-brown, shiny, and with the surface minutely pitted, tips of mandibles black, antennæ red-brown and legs brownish-yellow. They fed up on farmyard manure in the Insectary until 24th July, when one was found to have pupated and the beetle emerged on 2nd August, by which date two of the other grubs were found to have attained the adult stage also. The fourth specimen, which had already pupated on 25th July, emerged on 4th August. Pupation takes place in a spacious earthen cell specially formed underground, the pupa being enclosed in the larval skin as in the case of *Anomala*.

We have this beetle also from Pusa (April 1907, in bark of tree, and 30th April 1914), from Dacca (15th January 1906 and 27th July 1911), and from Tripurri (20th March 1905; in a mango trunk).

9. *Pentodon bispinifrons*, Reitt. (Arrow, F. I. Ceton. and Dynast., page 303.)

The distribution of this species extends considerably further south than is indicated in the "Fauna" volume. We have it from Lyallpur

(at light, 10th June 1906 and 17th August 1911), Simla (July 1909, Carson Coll.), Baroda (Sugarcane, 17th August 1907), Chapra, Bihar, (Mackenzie Coll.), and from Pusa (23rd June 1905, in cane field; April 1909; at light on 4th December 1905; June 1907; June 1910; 19th August 1908).

10. *Holotrichia conferta*, Shp.

Two specimens collected on Coffee, Santikoppa, Coorg, 10th April 1912, by R. D. Anstead, have been identified as this species by Mr. Arrow.

We also have it from the Nilgiris (Pykara, 6,000 feet, May 1911, Andrewes Coll.) and it is one of the various Cockchafer which appear in Ootacamund after the showers in April and May. The species is figured in *South Indian Insects*, fig. 68, No. 9.

11. *Brahmina coriacea*, Hope.

This beetle has been sent in on two occasions, on 30th June 1910 and 1st July 1912, by the Superintendent of the Government Garden at Jeolikote, Kumaon, who reported that the beetles suddenly appeared in large numbers and fed during the night on leaves of vine, fig, apple, pear and plum, devouring the portions of the leaves between the veins. They were particularly destructive to the leaves of vine and apple, and were associated with *Adoretus versutus* and *A. horticola*.

12. *Anomala bengalensis*, Bl.

Three specimens bred from larvæ in leaf-mould at Pusa, April-May 1910. (C. No. 831).

The larvæ were found in June 1909 feeding on leaf-mould in a pit, which had been specially made and filled with leaf-mould for the purpose of planting avenue trees. The full-grown grub was about 40 mm. long and about 8 mm. broad, of the usual shape of Melolonthid larvæ, in colour pale-yellow, the posterior two segments blackish owing to intestinal contents, the head yellow-brown with the apical half of mandibles black; on the segments were longish brown hairs scattered over dorsal and ventral surfaces and also some very short spinous hairs on the back of the first six abdominal segments and on the tip of the anal segment; spiracles yellow-brown, strongly crescentic in shape, the crescent directed posteriorly on prothorax and anteriorly in the case of the abdominal spiracles. The adult beetles emerged on 20th April, 5th May and 19th May 1910.

The beetle is very close to *A. varians* with which it has been confused hitherto but its comparatively shorter and broader size and slightly

excised clypeus distinguish it from *A. varians*, in which latter species the clypeus is evenly rounded.

13. *Anomala (Pseudosinghala) transversa*, Brsk.

This species was very common at Shillong, in the Khasi Hills, in May 1905, being found on cherry as a minor pest. A note made at the time reads :—" Above 4,000 feet these beetles come out of the ground in enormous numbers by day and feed on white flowers, roses, *Spiræas*, etc. Black and yellow-spotted [individuals] couple together and appear to be one species. Caught at white cloth in large quantities but not at light."

A series of thirty-five specimens reveals a considerable range of variation. The normal form is black with a broad irregular transverse orange band across the centre of anterior half of each elytron, but entirely black specimens are almost equally common, whilst in other cases the orange markings may extend over the whole, or almost all, the surface of the elytra.

14. Minor Pests of Peach at Maymyo.

Two Rutelid beetles, collected at Maymyo in Upper Burma on 17th and 18th May 1909, by K. D. Shroff, Entomological Assistant, as attacking leaves of Peach (*Prunus persica*) have been identified by Mr. Arrow as *Anomala aurora*, Arrow, and *Anomala pallidospila*, Arrow.

The Pusa Collection contains a co-type each of *Anomala aurora* and *Anomala pallidospila*, collected by Mr. H. L. Andrewes at Maymyo in May 1910.

15. *Adoretus limbatus*, Bl.

Fairly common at light at Pusa in June. We have it also from Katihar, Bengal (ex Ind. Mus. Coll.) and from T'oungoo (ex Andrewes Coll.). This is a small dark-coloured species, with a distinct pale longitudinal stripe bisecting each elytron, sides of thorax and costal edge of elytra broadly yellowish.

16. *Adoretus ovalis*, Bl.

We only have this from Ootacamund (9th April 1901 ; Barber Coll.). It is figured in *South Indian Insects*, fig. 127.

17. *Adoretus bicaudatus*, Arrow MS.

The Pusa collection contains a single example of this beetle, sent in on 12th October 1908 by Mr. C. E. Presley from Fenchuganj in Sylhet, with a note stating that " the leaves of nearly all the trees, roses and others, in the garden at Fenchuganj appear like lace, they have been so thoroughly eaten away by these beetles.

18. *Adoretus lasiopygus*, Brsk.

This appears to be the commonest species of *Adoretus* in the Pusa District and is probably the species usually responsible for damage to leaves of garden plants between June and September. The adult beetles come fairly freely to lights at night.

We also have it from :—

Calcutta (Ind. Mus. Coll.) ; Begun Serai, Bengal, 22nd July 1904 ; Daltonganj, Bengal, August 1905, on Cucumber (C. S. Misra) ; Palamau, Bihar, September 1906 ; Chapra, Bihar (Mackenzie) ; Jorhat, Assam, 29th June 1907 ; and Rewari, Punjab, 4th October 1905 (C. S. Misra).

At Begun Serai it did serious damage to vines and, after absolutely stripping the vines of every leaf, the beetles attacked the fresh shoots.

19. *Adoretus caliginosus*, Brsk.

We have this from Pusa (6th June 1908, and at light on 1st July 1914), from Jorhat in Assam (29th June 1907 ; captured in association with *A. lasiopygus*), from Jalalpur in the Surat District of Bombay (5th May 1904), and from the Bababudin Hills in Mysore (April 1913).

20. *Adoretus versutus*, Har.

This seems to be a common species around Calcutta, whence we have specimens taken at night on *Lagerstrœmia* in the compound of the Indian Museum. We also have specimens from Jorhat, Assam (29th June 1907), from Chapra in Bihar (Mackenzie Coll.) and from Pusa (31st July 1905, 1st July and 26th September 1907 and 13th October 1908), where it seems not to be very common and to occur later in the year than most other species of *Adoretus*. It was also found attacking leaves of vine, fig, apple, pear and plum at the Kumaon Government Gardens in June 1910 and 1912 in association with *Adoretus horticola* and *Brahmina coriacea*. It is probably common throughout the Plains of India.

This is the species referred to under the name *Adoretus bangalorensis* in *Indian Museum Notes* and *South Indian Insects* and it may again be pointed out that the figures of this species and of *Adoretus caliginosus bicolor* were originally transposed by error in *Indian Museum Notes* and that this error was repeated in *South Indian Insects*, so that figure 126 in the latter publication represents *A. versutus*.

A partial reference to literature will be :—

Adoretus versutus, Harold, Coleopt. Hefte V. 124 (1869) ; Kolbe, Mitt. Zool. Mus. Berlin, V. 22 (1910) ; Scott, T. L. S. XV 235, t. xii, ff. 10—12 (1912).

Adoretus vestitus, Boheman, *Eugenies Resa* II i 56 (1858) [*nec* Reiche].

Adoretus insularis, Fairm., *Ann. S. E. Belg.* XLI, 105 (1897) ; Alluaud, *List Coleopt.*, p. 271.

Adoretus bangalorensis, Brenske, *I. M. N. V.*, 38, t. iv, ff. 1, 2 (1900) ; Fletcher, *S. Ind. Ins.* pp. 285—286, f. 126 (1914).

Adoretus versutus is known from India, China, Samoa, Fiji, Chagos Islands, Mauritius, Seychelles and St. Helena.

21. *Adoretus duvauceli*, Bl.

Specimens of this beetle were received on 30th June 1910 from the Superintendent of the Kumaon Government Gardens at Jeolikote, who reported that they were doing a great deal of damage to the leaves of vines and figs, feeding by night.

We also have this *Adoretus* from Pusa, 7th July 1906, 18th August 1908 and 12th September 1908, and from Chapra. This is a species not unlike *A. ovalis*, but distinctly larger and much darker in colour.

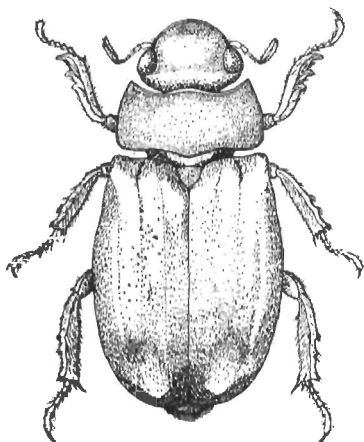


Fig. 1. *Adoretus duvauceli*.

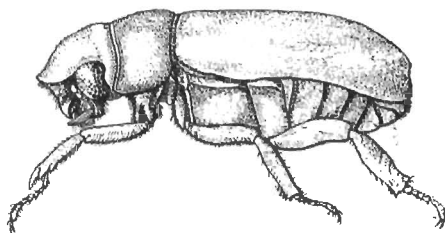


Fig. 2. *Adoretus duvauceli*.

(The small outline figure shows the natural size.)

22. *Adoretus horticola*, Arrow.

Specimens of *Adoretus horticola*, Arrow, were received in June 1910 and June 1912 from the Superintendent of the Government Gardens at Kumaon, where they were found attacking vine, fig, apple, pear and plum, devouring the leaves at night in association with *Adoretus versutus* and *Brahmina coriacea*.

23. *Pachyrhinadoretus rugipennis*, Ohaus.

Palamau, Bihar, September 1906, D. P. S. (? a pest); Parantij, Ahmedabad District, 21st September 1903; Kurnul, 1st October 1912; Chapra, Bihar :

We have this in some numbers from the above localities, though (curiously enough) not from Pusa.

24. *Popillia histeroidea*, Gyll.

Specimens collected by K. D. Shroff, Entomological Assistant, Burma, at Maymyo on 21st May 1909 were damaging leaves of *Prunus persica*.

We also have a specimen (ex Andrewes Coll.) taken at Maymyo in May 1910 and there is one in the Indian Museum from Maymyo, so that this species seems not uncommon in the Northern Shan States.

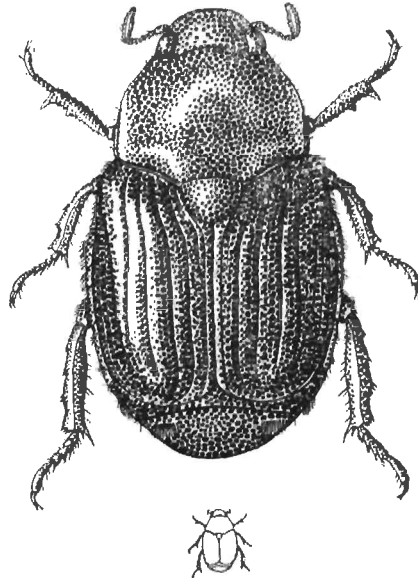


Fig. 3. *Popillia histeroidea*.
(The small outline figure shows the natural size.)

25. *Popillia cupricollis*, Hope.

Kumaon, United Provinces, I. R. No. 651 of 4th November 1909 from Superintendent, Government Gardens.

We also have it from Lebong (Darjiling District), September 1908 and September 1910; Turzum, Nagri Spur, Darjiling District (O. Lindgren); Simla, August 1909; Lansdowne, Garhwal, 19th October 1909; Masuri, August 1906; Copaldhara, British Sikkim (W. K. Webb Coll.).

26. New Injurious Indian Weevils.

In Part 4 of Volume V of the "Bulletin of Entomological Research" (March 1915) Mr. G. A. K. Marshall has described and figured as novelties four Indian Curculionidæ of economic interest. These are:---

- (1) *Phytoscapus dissimilis*, found nibbling young tea shoots in Assam,
- (2) *Corigetus bidentulus*, found as a serious pest of tea in Assam, occurring also in Upper Burma,
- (3) *Rhynchaenus (Orchestes) mangiferæ*, described from specimens from the Godavari district in Madras. It also occurs at Coimbatore. This is the insect described and figured in *South Indian Insects* (page 334, fig. 192) under the name of the "Mango Leaf-boring Weevil,"
- (4) *Pachytychius mungonis*, described from specimens from Bellary and Kurnul in the Madras Presidency. This beetle is figured and described, under the name of the "Green-gram Weevil," in *Some South Indian Insects*, pages 336-337, fig. 194.

27. Weevil Pests of Sunflower (*Helianthus annuus*).

A long series of upwards of two hundred specimens of *Xanthotrachelus faunus*, Oliv., in the Pusa collection has recently been identified by Mr. G. A. K. Marshall. The majority of the specimens, in cases where the foodplant was recorded, were collected on Ber (*Zizyphus jujuba*), on which this weevil is common, but numerous specimens were taken on Sunflower, which was attacked to a considerable extent when cultivated at Pusa in 1906. A few odd specimens are also labelled as found on grass and on rice.

Besides these examples from Pusa, the collection comprises specimens from Cuttack and Chapra in Bihar and Orissa, Khandala in Bombay Presidency, and from Maymyo in Upper Burma.

Besides *X. faunus*, a very similar species, *Xanthotrachelus perlatus*, Fb., was also found attacking newly-formed heads of Sunflower at Pusa in 1906. Odd specimens of this latter species are also noted as found on

Castor and on Cotton at Pusa. Except for the specimens from Pusa, the collection only contains a single example from Dehra Dun.

Both these species attacked Sunflower to a considerable extent and would probably be specific pests of this plant if cultivated on a large scale.

The following note regarding damage done to Sunflower was recorded on 25th August 1906 by Mr. C. S. Misra :—"The weevils seem to puncture the newly-formed Sunflower heads at the sides and, when a hole sufficiently wide has been made, they remain feeding on the head with their heads deeply embedded in the thick tissues of the sheathing tracts. If the beetles are in large numbers, the heads on being bored are liable to be affected by rain-water lying in the holes so made and setting up decomposition. The presence of the weevils is readily detected by their excrement which falls on the lower leaves of the plants."

28. Mango Weevils in Bengal.

A weevil was reported to be doing extensive damage to mangoes at Dacca in July 1911, but, by the time the report was received, the mango season was practically over and no beetles could be reared locally from mango fruit. Specimens of a *Cryptorhynchus*, which is presumably the guilty species, were however collected under bark of mango trees at Dacca and these have been identified by Mr. G. A. K. Marshall as *Cryptorhynchus poricollis*, Fst.

Another weevil from Dacca, collected "on mango shoot" on 19th September 1912 by P. C. Sen, Entomological Collector in Bengal, and sent in under his number E. 61, has been named by Mr. Marshall as *Alcidus frenatus*, Fst. The grub is stated to bore into the shoots of grafted mango trees in the Botanical Garden at Dacca and to do considerable damage.

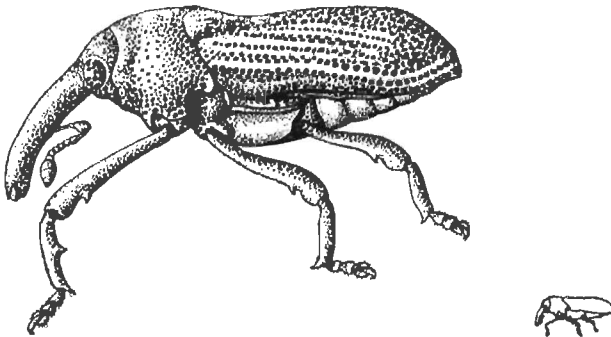


Fig. 4. *Alcidus frenatus*.
(The small outline figure shows the natural size.)

29. A Weevil boring in dried bamboo in Ceylon.

When at Peradeniya in April 1914 I found a newly-constructed fence formed of strips of bamboo which were being extensively riddled by a weevil which was attracted to the newly-cut wood in very large numbers. This weevil has now been identified by Mr. G. A. K. Marshall as *Myocalandra exarata*, Boh.

30. Weevils in Tamarind fruits.

A weevil found breeding in some numbers in stored Tamarind fruits at Pusa in September 1908 has been identified by Mr. G. A. K. Marshall as *Calandra linearis*, Hbst.

31. Lifehistory of *Batocera rubus*, L.

A female specimen of *Batocera rubus*, caught at Pusa on 15th July 1914 and fed on fresh branches of Gular (*Ficus glomerata*) and Mango, lived in confinement until 13th September and deposited several eggs on and after 19th July. The first egg hatched on 30th July, the newly-hatched grub being about 7 mm. long; by 23rd August it was 25 mm. long, by 7th September about 44 mm., and by 25th September 48 mm. On 26th January 1915 only two larvæ were found alive; they were then about 62 mm. long, had ceased feeding and were apparently about to pupate; one beetle emerged on 13th May 1915, and of these one lived until 3rd August. The lifehistory, further details of which are reserved for another occasion, is thus shown to occupy one year.

32. *Stromatium barbatum* in Piano-wood.

In December 1914 a living specimen of a Cerambycid grub was received from a well-known Calcutta Firm with the information that these grubs were causing damage by boring in Piano-wood. The grub was reared in the Insectary and emerged on 26th June 1915 as *Stromatium barbatum*. The lifehistory of this beetle is apparently of one year's duration, the eggs being laid about June-July, the larvæ feeding up until about the next March, and the beetles emerging from May to July. The larva is commonly found boring into domestic furniture.

This case was of some interest because the Firm concerned believed that the wood, which was imported from Europe, was infested prior to importation into India. A knowledge of the exact identity of the insect concerned, however, proved that infestation took place in Calcutta.

33. Early stages of *Pachnephorus impressus*.

Larvæ of *Pachnephorus impressus* were found in the soil amongst roots of Maize (*Zea mays*) at Pusa on 11th August 1914. The larva

was about 4 mm. long and 0.75 mm. broad, cylindrical, tapering abruptly posteriorly, the segments distinct, very pale yellow, the head slightly darker. The thoracic legs are well developed and the first eight abdominal segments have also paired appendages (pseudopodia) on the ventral surface, each directed anteriorly and carrying several posteriorly-directed brown hairs. In life the larva remains slightly curved ventrally as shown in the figure.

Both larvæ and pupæ were found in the soil amongst maize roots. From a larva, which pupated on 14th August, the beetle emerged on 19th August 1914.

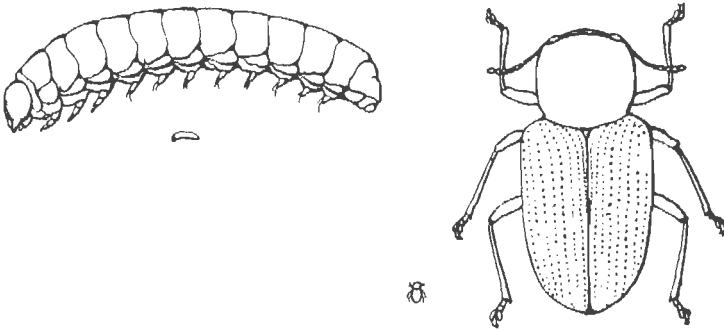


Fig. 5. *Pachnephorus impressus*.
(The small outline figures show the natural sizes.)

34. Cantharidin in Indian Blister-beetles.

In many districts in India Blister-beetles (Meloidæ) occur in very large numbers and in the adult stage are often found doing serious damage to crops although the early stages, in those species of which the early stages are known, are beneficial, as their grubs feed on eggmasses of grasshoppers. Owing to the large numbers in which the beetles occur it is feasible to collect them in some quantity and this has been done in the case of several species with a view to testing whether they are likely to be useful, especially in veterinary work, as vesicatory agents.

Two species were tested at Poona in January 1915 and the result, as communicated by Dr. H. H. Mann, gives the percentage of Cantharidin in the dried beetles as :—

<i>Lytta tenuicollis</i>	0.75 per cent.
<i>Lytta picta</i>	0.63 „ „

whilst a sample of *Epicauta* sp. from the Punjab yielded 0.28 per cent. of Cantharidin on analysis by Dr. Mann.

A sample of sundried *Lytta tenuicollis* was also analysed in August 1913 at the Agricultural College at Lyallpur by Mr. J. H. Barnes, who reports the following composition :—

“ Total extracted matter extractable by alcoholic hydrochloric acid and a mixture of petroleum ether and benzine . . .
23·89 per cent.

Total Cantharidin	2·17 per cent.
Free Cantharidin	1·97 „ „
Combined Cantharidin	0·2 „ „

“ The extractable material other than Cantharidin consists of oil and fatty matters, free acetic and uric acids and phosphates of calcium and magnesium.”

The difference between these two figures is considerable, due perhaps to differences in the methods of collection or preparation of the beetles, but it is clear that *Lytta tenuicollis* contains a relatively high percentage of Cantharidin, a fact which is evidenced by the effect produced by contact of the living beetle with the tender human skin.

35. Sporadic abundance of *Lytta actæon*.

On 17th July 1915 a few specimens of *Lytta actæon* were brought to Pusa with the information that this Blister-beetle was present in large numbers in a field of *Setaria* on the north bank of the Chota Gandak River. On visiting the locality indicated, the beetles were found to be present in very large numbers, running rapidly over the ground or climbing up the *Setaria* plants and defoliating them. An adjacent field of *Andropogon Sorghum* was quite free from the beetles. They did not seem capable of flight but ran about with the body well raised above the ground and the abdomen slightly depressed away from the elytra so as to exhibit the reddish blotch situated on either side of the posterior end of the abdomen. The damage done was considerable as the beetles ate the leaves most voraciously and were present in large numbers, often four or five beetles on one plant. Large numbers were collected and kept in a large cage in the Insectary, but though they fed freely on *Setaria* leaves and lived for about a fortnight, no attempt at coupling was observed nor any eggs obtained ; it was noticed, however, that they were fond of hiding themselves gregariously in holes in the ground.

Usually *Lytta actæon* is rather a scarce species at Pusa but occurred in some numbers in the latter half of August 1905. Other dates for Pusa are 18th June and 10th July 1905, 10th June and 16th August 1907, 18th June 1908, 2nd July, 2nd August and 4th September 1913.

We also have it from Cuttack (on *aus* paddy, 20th July 1907); Cawnpore (22nd August 1909); Kasur, Punjab (12th July 1911); Surat (September 1903); Khandesh (T. R. Bell Coll.; no date).

36. Life history of *Monomma brunneum*, Thoms.

The rotten Papaya stem referred to in Note No. 1 contained a large number of grubs of this beetle. The following description of the larva was made in the Pusa Insectary: "Elongate, flattened, the sides almost parallel, slightly attenuated anteriorly. Head brown; all the other segments yellow, somewhat chitinized and shiny. Posterior segment brown with two short, brown, upturned pointed processes on each side and a flattened brown central upturned process. Three pairs of well-developed thoracic legs. The grubs are active." These larvæ were collected on 16th July and the beetles emerged on 17th and 18th August 1914.

A second lot of larvæ was found, also in a rotten Papaya stem, on 28th October 1914. The larvæ went down into the earth on 7th November. One pupated on 22nd November and attained the adult condition on 21st December, but took nearly a month to become mature, being still brown in colour on 2nd January 1915, turning darker on 9th January, and only becoming active on 18th January when it had turned completely dark-brown, almost black. It must be remembered that the weather was cold during this period. Another larva passed through the cold weather without changing, hibernating in the pupal cell.

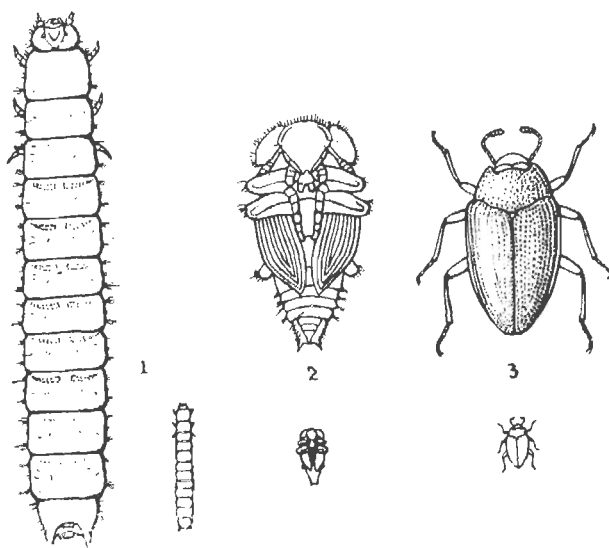


Fig. 6. *Monomma brunneum*.
(The small outline figures show the natural sizes.)

37. Some Indian Dermestid Beetles.

In the *Annals and Magazine of Natural History*, Series 8, Vol. XV, pages 425-51 (May 1915) Mr. Gilbert J. Arrow has given some "Notes on the Coleopterous family *Dermestidae*," from which are extracted the following observations on Indian species of economic interest :—

- (a) The generic name *Æthriostoma* is a synonym of *Attagenus*. The Dermestid common in stored wheat in the dry districts of Northern India should therefore be known as *Attagenus undulatus*, Mots. It occurs also in Ceylon, Singapore, Hongkong, the Philippines, Madagascar, Mauritius, and Australia. *Brachysphyrus irroratus*, Blackb., and *Attagenus rufipes*, Wlk., are synonyms.
- (b) *Trogoderma versicolor*, Creutz., is recorded as having been found in rice and wheat in India. It is a common European and cosmopolitan species, identical with *T. inclusum*, Lec. We have it from Lyallpur (in stored wheat).
- (c) *Anthrenus vorax*, Waterh., is synonymous with *A. fasciatus*, Herbst., and the name should be corrected accordingly.
- (d) *Anthrenus subclaviger*, Reitt., originally described from Aden, is now recorded from Calcutta, the Punjab, and North-west Himalayas.
- (e) The following Indian species are described as new :—
Attagenus birmanicus, Upper Burma; *Orphinus jucundus*, Belgaum; *O. nilgirensis*, Nilgiris; *O. minor*, Belgaum; *O. tabitha*, Ceylon (Kandy, Dikoya); *O. funestus*, Ceylon (Dikoya); *Anthrenus subsetosus*, Upper Burma; *A. globiger*, Calcutta; *Apsectus indicus*, Belgaum; *Trinodes emarginatus*, Ceylon (Kandy).

38. Early stages of *Thea cincta*.

The Coccinellid beetle, *Thea cincta*, was reared on Red Spider (*Tetranychus*) on Jute leaves in the Pusa Insectary in October 1914 from a cluster of twenty-three eggs found on the under-surface of a Jute leaf. The egg is dull-whitish, elongate, cigar-shaped, with a smooth surface, and measures about 1 mm. in length. The grubs hatch out by bursting the free top ends longitudinally, the fissure extending downwards for about half the length of the egg.

The newly-hatched grub is about 1.5 mm. in length, flattened, the segments distinct, in colour pale yellow with a blackish spot on each side of the head and a black subdorsal spot on all the thoracic and abdominal segments except the anal segment which has a black plate.

The thoracic legs are long and well-developed and the young grub is very active.

The full-grown larva is about 9 mm. long, and similar in shape and general colour to the young grub but is tinged with yellow dorsally and has a median black marking on the head, the black thoracic spots are transversely elongated, and there is also an additional row of dorso-lateral black spots on all abdominal segments except anal.

Pupation takes place on a leaf or stem. The pupa, which is about 5 mm. long and 3 mm. broad, is pale-yellow with irregular deeper yellow dorsal patches, four black markings on posterior edge of pronotum, and the margins of wing-sheaths black, and a subdorsal black spot on first six abdominal segments.

From eggs found on 17th October were obtained larvæ which pupated on 24th October and emerged as adult beetles on 29th October 1914, so that the lifehistory is a very short one.

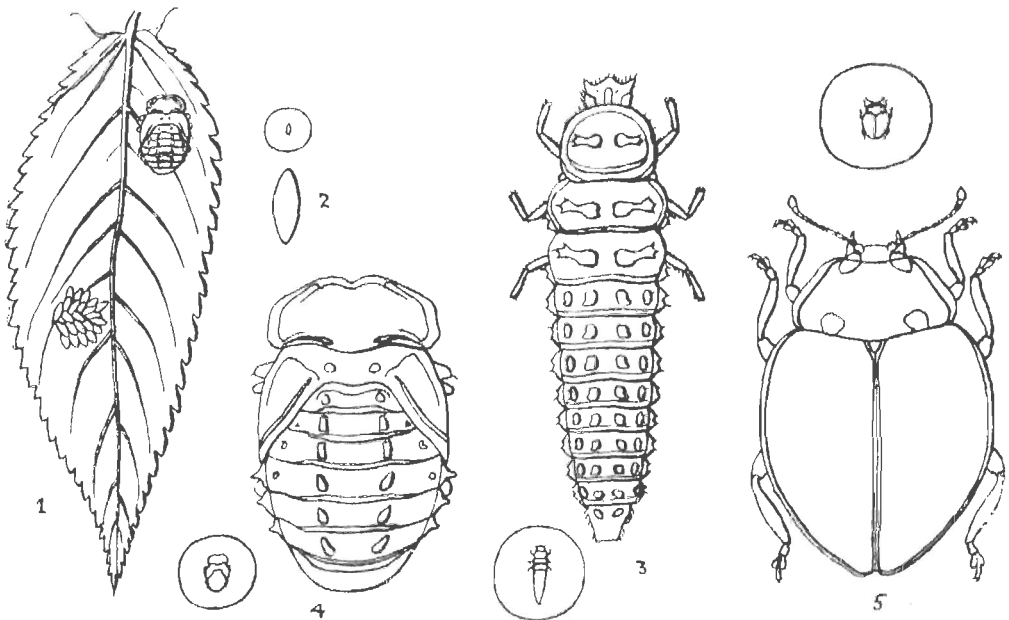


Fig. 7. *Thea cineta*.
(The small outline figures show the natural sizes.)

39. *Chrysomya aenea*, Fb.

Bred (with numerous other flies) from Farmyard manure at Coimbatore, December 1913.

The species is also common at Pusa and doubtless throughout the Plains of India. We have it also from Meiktila in Upper Burma (August 1914; Fletcher Coll.).

40. *Sepedon ferruginosus*, Wied.

Common at Pusa in December-February. Also found on Paddy at Kezanathum in the Tinnevely District (October 1913; Ponniah Coll.) and swept from Paddy at Chaumahani, Noakhali District, Bengal, 5th December 1911 (Fletcher Coll.). Not known to be a pest of Paddy.

Sepedon aenescens, W., is represented in the Pusa Collection by specimens from Chapra, Bihar (Mackenzie Coll.).

41. *Xenaspis pictipennis*, Wlk. (*vespoides*, Meij.)

This large fly was found commonly in North and South Coorg in May 1914. Its flight is heavy and its appearance, when on the wing, decidedly wasp-like. The flies sit on tree-trunks and on leaves, frequently on leaves of Pepper Vines growing up the trees. When caught, the fly extends its mouthparts and exudes therefrom a large drop of opaque brownish liquid which it deliberately attempts to smear upon its captor. I was informed by a local Coffee Planter that he had seen these flies feeding upon cowdung but the numerous specimens which came under my own observation were not observed to do this.

42. *Oxyna parca*, Bezzi. (Mem. Ind. Mus. III. 159-160, t. 10, f. 62.)

This species was described from a single pair taken at Calcutta in September and October 1907. We have a specimen from Tranquebar 6th to 9th May 1915, so that this species is probably widely distributed in the Plains. Nothing is known of its lifehistory.

43. *Campiglossa cribellata*, Bezzi. (Mem. Ind. Mus. III. 161, t. 10, fig. 63.)

Described from a single specimen from Kurseong. The Pusa collection also contains a single specimen taken at Pusa on 19th March 1914.

44. *Tephritis zodiacalis*, Bezzi. (Mem. Ind. Mus. III. 163-164, t. 10, f. 65.)

A single specimen from Pusa on 4th January 1915. Apparently not a common species as it was described from a single specimen from Calcutta in the Indian Museum collection.

45. *Tephritis zonogastra*, Bezzi. (Mem. Ind. Mus. III. 164, t. 10, fig. 66.)

This species was described from a single specimen in the Indian Museum collection taken at Puri in December 1908. It is therefore interesting to note that this species is also included in a small collection of insects made in May 1915 at Dungagali, at an elevation of over 8,000 feet in the Hazara District.

46. *Tinda indica*, Wlk.

Bred at Pusa, August 1913, from larvæ found in a Plantain stem. Also from Chapra, Bihar (Mackenzie Coll.).

47. *Argyramoeba ceylonica*, Brun.

Bred at Pusa as a parasite of *Pseudogenia clypeata* (18th March 1909; G. R. Dutt). This is the species referred to as *Hyperalonia* sp. in *Entom. Mem. IV*, pages 195-196, and the necessary correction therein may be made accordingly.

48. *Systoechus socius*, Wlk.

Bred from larvæ predaceous on eggs of *Colemania sphenarioides* at Hadagalli, Bellary District, in October 1911 (Y. Ramachandra Rao coll.; No. 409). A very distinct-looking species with strong yellowish pubescence. In another specimen from Coimbatore (30th May 1912) the colour is pale yellowish-grey.

This is the species referred to in *South Indian Insects* (page 201).

49. *Paragus serratus*, Fb.

Predaceous on Green Aphid on *Phyllanthus emblica*, Pusa, 27th July 1914. (C. No. 1072).

We also have it from Samalkota, where it was found predaceous on Aphid on shoots of *Cajanus indicus*, 23rd November 1906 (Y. Ramachandra Rao) and from Coimbatore (19th September 1913; Fletcher Coll.) where this fly was found in a Ragi field and is almost certainly the Syrphid predaceous on the Ragi Root Aphis (see *South Indian Insects*, page 198).

50. *Sphaerophoria scutellata*, Fb.

Bred from larva predaceous on Aphids on garden Crysanthemum, Pusa, 1st February 1915 (Fletcher Coll.), and from larva feeding on Watermelon Aphis at Hagari, Bellary District, 11th May 1907 (Y. Ramachandra Rao Coll.; No. 109). We also have this species from the Anamalai Hills

(Kalyana Pandal ; 3,000 feet, 25th January 1912 ; Fletcher Coll.), from Coimbatore (on cotton ; 8th June 1912 ; Fletcher Coll.), and from Assam.

This is the species shown on the coloured plate of a Syrphid Fly in *Indian Insect Life* (Plate LXIV) and in *South Indian Insects* (Plate XV).

51. *Atherix cincta*, Brunetti.

A single specimen from Maymyo (Upper Burma ; 3,500 feet) in August 1914 (Fletcher Coll.).

52. *Macrocera flavicosta*, Brunetti. (Faun. Ind. Dipt. Nemat., page 53. t. i. f. 3.)

A single specimen from Ootacamund (7,500 feet) in December 1913 (Fletcher Coll.). This species was described from a specimen "without exact data, but certainly captured in the East, most probably in India," so that the present record presents the first exact locality.

53. *Sciara rufithorax*, Wulp. (Brunetti, Faun. Ind. Nemat., pages 128-129, t. iii. f. 15.)

Bred at Pusa on 24th August 1914 from a mass of larvæ found underground. More than a hundred larvæ were found intertwined into a large lump, all of them continually moving but never separating from the mass. If one moved in any direction, others would follow so that a protrusion occurred from the main body which might be elongated in following these leaders ; but those in the rear soon closed up so that the whole formed one mass as before.

These larvæ were found on 19th August and were evidently full-grown, as a few pupated next day and almost all the rest on 21st August. In pupating they spread out over the surface of the earth and were found to have spun a little silk (? dried mucus) which webbed together a few pellets of earth, but no regular cocoon was formed.

Eighty-five flies emerged on 24th August and there were also twenty-four other individuals which either died or were preserved in the earlier stages.

54. *Pselliophora laeta*, Fb. (Brunetti, F. I. Dipt. Nemat., pages 291-292, t. v. f. 2, t. vi. f. 9.)

Two specimens from Santikoppa, North Coorg, in May 1914 (Fletcher Coll.). The species is apparently widely distributed in the Hills in

Southern India. We also have it from Hillgrove, in the Nilgiris (4,000 feet), 27th April 1915.

55. *Pselliophora taprobanes*, Wlk. (Brunetti, F. I. Dipt. Nemat., pages 293-294, t. v. f. 3, t. vi. ff. 10, 11.)

A male from Yercaud (4,500 feet) in the Shevaroy Hills in December 1913 (Fletcher Coll.). This species seems to have been recorded only from Ceylon hitherto.

56. *Tipula melanomera*, Wlk. (Brunetti, F. I. Dipt. Nemat., page 330.)

Two specimens from Maymyo in Upper Burma (August 1914; Fletcher coll.) appear to belong to this species which was originally recorded from Nepal. It is apparently not a common insect, as it was not represented in the Indian Museum collection where one of these specimens has now been deposited.

57. *Teucholabis fenestrata*, O. S. (Brunetti, F. I. Dipt. Nemat., page 429, t. viii. f. 14, t. xi. f. 10.)

One specimen from Maymyo (3,500 feet) in Upper Burma, August 1914 (Fletcher coll.). This species has been recorded from Ceylon and North-East India but does not seem to have been noted definitely from Burma.

58. *Gymnastes cyanea*, Edw. (Brunetti, F. I. Dipt. Nemat., pages 431-432.)

Gymnastes violaceus. Brunetti, Rec. Ind. Mus. VI. 282, F. I. Dipt. Nemat., pages 433-434, fig. 42, t. viii f. 10.)

A single specimen from Sidapur, Coorg, in November 1912 (Fletcher coll.). In life it mimicks a Reduviid bug. This species has hitherto been recorded only from Ceylon.

59. *Conosia irrorata*, Wied. (Brunetti, F. I. Dipt. Nemat., pages 497-499, fig. 43.)

We have this from Pusa, Peshawar, Hopin in Upper Burma (30th August 1914; Fletcher coll.) and from Thaton and Rangoon in Lower Burma (September 1914; Fletcher coll.). It frequently occurs in large numbers in Paddy fields, being attracted to light at night, and must be looked on with suspicion as a probable minor pest of Paddy.

60. *Rhyphus distinctus*, Brunetti. (Rec. Ind. Mus. IV. 262, F. I. Dipt. Nemat., pages 556-557, t. xii. f. 6.)

A single specimen from Ootacamund (7,500 feet) in December 1913 (Fletcher coll.). This species is only recorded hitherto from the Darjiling District and from Assam.

61. *Euchromia polymena* as a pest.

The larvæ of *Euchromia polymena*, L., have been reported by R. M. Pillai as an occasional minor pest of Sweet Potato in Travancore, destroying the leaves. As a rule the larvæ feed on wild Convolvulaceæ.

62. *Sesamia inferens* and *S. uniformis*.

The references to these two species in Indian Economic Entomology have led to considerable confusion and it may be useful to indicate the differences. In *Sesamia inferens*, Wlk., the antennæ of the male moth are bipectinate with extremely short branches, the apex serrate; in *S. uniformis*, Ddgn., the cilia of the male antennæ are fasciculate.

Examination of the series in the Pusa Collection indicates that *S. inferens* is the commoner of the two and we have this from Pusa (rice-stubbles, rice-stem, Guinea-grass stem and sugarcane), Bankipur (rice-stem), Nagpur (wheat-stem, juar-stem and maize), Seoni (wheat), Coimbatore (ragi, Sorghum-stem and tenai (*Setaria*), Hagari (rice-stem), Surat (maize, wheat-stem, juar-stem) and Navsari (maize).

Sesamia uniformis we have only from Lyallpur (sugarcane and maize) and Pusa (a single specimen reared from a maize-stem).

Further long series of these insects from all localities are required to ascertain their distribution and foodplants.

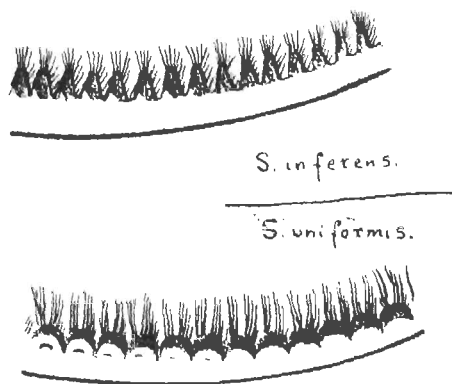


Fig. 8. *Sesamia inferens* and *S. uniformis*, portions of male antennæ.

63. Synonymy of "*Ophiusa melicerta*."

In the *Review of Applied Entomology*, Series A, Vol. III, p. 145 (March 1915), this species is referred to as *Achæa janata*, Linn., and reference to the original authority shows that the description is applicable. The synonymy will therefore be:—

Geometra janata, Linn., Syst. Nat. (ed. X), p. 527 (1758), l. c. (ed. XIII) p. 2479.

Phalaena janata, Fab., Sp. Ins. II, 263 (1781), Mant. II. 206 (1787), Ent. Syst. III. ii. 190 (1794).

Noctua melicerta, Drury, Ill. Exot. Ins. I. 42, t. 23 f. 1. (1770).

Ophiusa melicerta, Hmps. n., Faun. Ind. Moths, II. 494-495, etc.

As regards the generic name *Achæa*, see Sir George Hampson (*Catalogue of the Lepidoptera Phalaenæ*, Vol. XII, page 496).

64. Fruit-destroying Moths.

In July 1914 the Superintendent of the Kumaun Government Gardens forwarded for identification some specimens of moths which were stated to "do an enormous amount of damage to fruit crops, particularly peaches and nectarines. They commence their ravages at about 9 P.M., puncturing all the fruits on which they alight..... They are most destructive and will most certainly ruin the peach industry as far as this elevation is concerned."

The moths proved to be nearly all specimens of *Calpe ophideroides*, which was not previously represented in the Pusa Collection. The sending included also one specimen each of *Ophiusa honesta* and *Achæa janata* (*Ophiusa melicerta*), both of which were probably merely accidental visitors attracted to fruit which was rotting or already damaged by *Calpe ophideroides*. On examination of the tongue of this last named species, it will be seen that the tip of the tongue (as shown in the figure) is armed with a formidable array of spines which are quite capable of cutting through the skin of a peach.

Another common Indian moth whose tongue is similarly armed is *Ophideres fullonica* which has acquired a sinister reputation in South Africa and Queensland on account of its habit of puncturing orange fruits in a similar way. This species is recorded (*Indian Museum Notes*, Vol. V, page 118) as attacking pomelo fruits at Tardeo, Bombay, causing a loss of a quarter to a third of the crop, the attacked fruits falling from the trees.

As regards control measures, it might be possible to trap the moths in pans or bottles containing water with a little ripe fruit and jaggery

or to poison them directly by means of baits, of jaggery mixed with Lead Arsenate, suspended in or near the trees attacked.

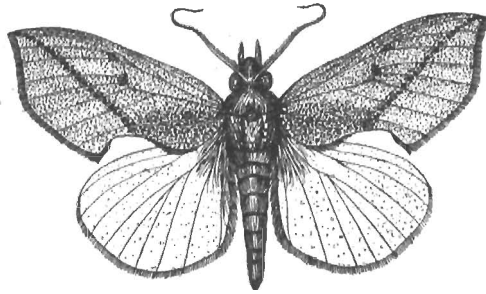


Fig. 9. *Calpe ophideroides*,

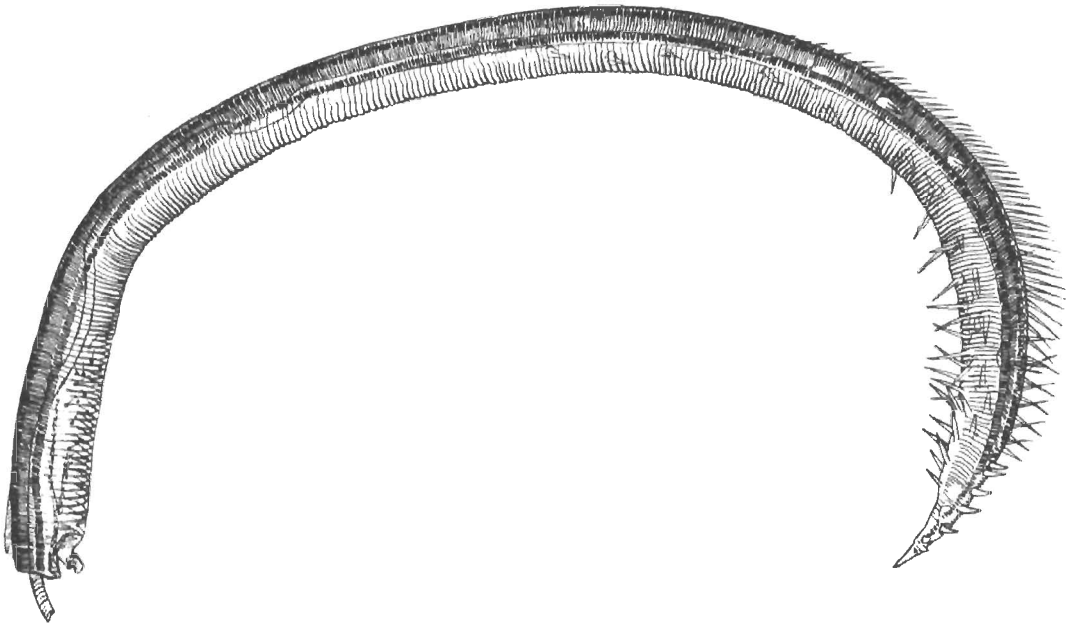
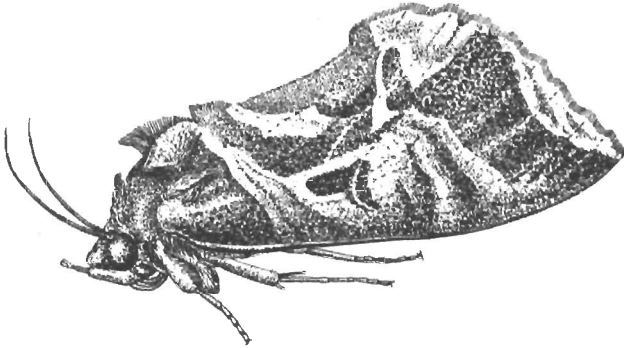
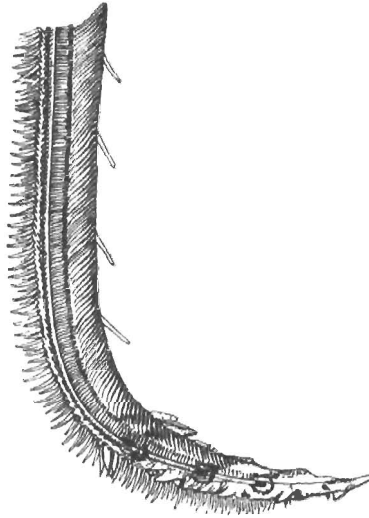


Fig. 10. *Calpe ophideroides*, tongue, greatly magnified.

Fig. 11. *Ophideres fullonica*.Fig. 12. *Ophideres fullonica*, tip of tongue, greatly magnified.

65. Early stages of *Leucophlebia lineata*.

A female of *Leucophlebia lineata*, caught at light at Pusa on the evening of 6th July 1915, was confined on a small sugarcane plant and deposited 207 eggs by 10th July, when it died. The eggs, which were laid at night, were scattered over the cane leaves and the inside of the cage, each attached separately. The pearly egg is small for the size of the moth, about 2 mm. by 1.5 mm., the surface smooth and shiny and greenish-yellow in colour. The first eggs, which were laid on the night of 7th July, hatched on the morning of 12th July, the larvæ devouring the empty eggshells before wandering in search of food. Leaves of maize and sugarcane were offered, but only the cane-leaves were

eaten. The first larva went into the earth about a month, and the last about seven weeks, after hatching, the moths emerging from 24th August onwards.

The general appearance of the larvæ is shown in the figures, where (1) represents a larva at the end of the antepenultimate moult and (2) a larva in its last instar. The difference in the shape of the head, in the younger and later stages, is very noticeable. The general colour of the fullgrown caterpillar is bright pale green with a whitish subdorsal stripe, and the sides of head, legs, and tail rosy pink. The larva rests head-downwards on the edge of the leaf, eating inwards from the margin. The pupa is dark reddish-brown. A fuller description of the early stages is reserved for another occasion.

Leucophlebia lineata has not been noted as a pest of sugarcane in India but occasionally appears in small numbers and may perhaps at times become a minor pest. It is known to feed on sugarcane in Formosa and Java.

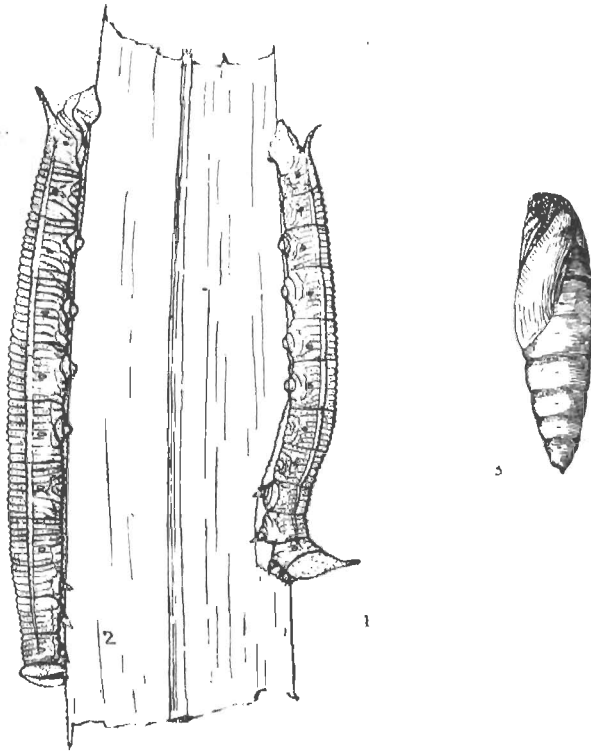


Fig. 13. *Leucophlebia lineata*.

66. Gynandromorphism in a Lasiocampid Moth.

The figure represents a noteworthy gynandrous example of *Metanastris hyrtaca* reared by R. M. Pillai on 27th July 1914 from a larva found at Trivandrum, Travancore State, on the bark of a tree of *Eugenia jambolana*. As will be seen, the wings and antenna on the right-hand side are male, those on the left-hand side female, the difference being accentuated by the different size, shape and markings of the wings in the two sexes. The genitalia have not been dissected out but the general shape of the body resembles that of a male although, as will be seen by inspection of the lower figure which shows the posterior portion of the abdomen as seen from beneath, the apex of the abdomen is strongly asymmetrical and the accessory sexual characters apparently partake of those of both sexes, male on the right-hand side and female on the left as in the case of wings and antennæ.

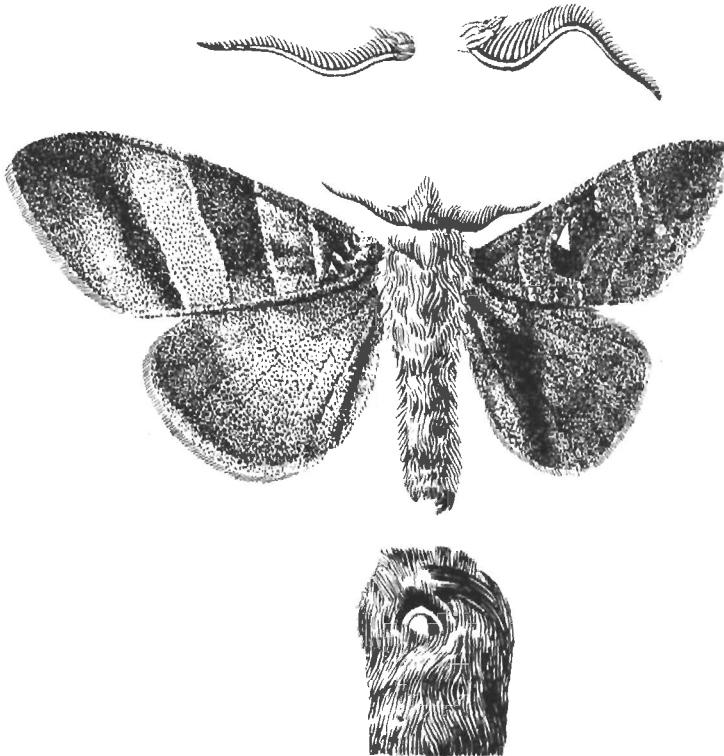


Fig. 14. *Metanastris hyrtaca*.

67. *Catopsilia* eaten by Drongo.

On 15th April 1912, at Pusa, I saw a *Catopsilia* fly out of a Litchi-tree whereupon it was pursued by a Drongo (*Dicrurus ater*). The butter-

fly doubled and twisted and a second Drongo joined in the chase, but the first bird caught the butterfly after at least half-a-dozen attempts, flew away with it on to a branch, and ate it. Apparently wings and all were eaten, as I watched but did not see anything drop. This took place at about 7 A.M. ; it was a dull and (for the time of year) cold morning. Probably the bird was hungry as few insects were astir owing to wind and absence of sun. The butterfly was probably *Catopsilia crocale*.

Exact records of the attacks of birds on butterflies are much wanted in India. There is no doubt that birds do eat butterflies and this probably occurs much more commonly than is generally supposed, but it is usually impossible to identify the species concerned, as the birds are acutely conscious of observation. During the Christmas holidays of 1913, when at Ootacamund, I saw four cases of birds attacking and capturing butterflies, but in no case was it possible to be certain of the species.

68. Aberration of *Pieris brassicae*, L.

The figure shows an unusual aberration of *Pieris brassicae*, L., reared at Pusa on 10th March 1915 from a larva found feeding on *Nasturtium* (*Tropaeolum*). The usual black markings of the forewings are much extended, the base of wings and costal area being heavily irrorated with black scales, the upper black spot prolonged into the terminal black margin which is continued to the tornal angle where it joins the elongated black streak on inner margin, whilst the lower black spot (below vein 2) is prolonged outwards and connected to the terminal border and the upper spot by distinct black irroration. On the hind-wing there is some black irroration towards termination of veins 5, 6 and 7. On the under-surface of forewing the two black spots are connected by black irroration.

The other individuals (four males and two females), bred from this batch of larvæ, were quite normal.

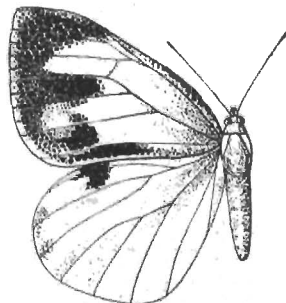


Fig. 15. Aberration of *Pieris brassicae*,

69. Synonymy of "*Scirpophaga auriflua*."

In the "Fauna of India" (Moths, Vol. IV, p. 46), Sir George Hampson quotes the names given to this insect by Walker and Zeller, giving the ~~former~~ precedence. But Meyrick had already shown (*Ent. Mo. Mag.* 1890, 111) that part XXVII of Walker's Catalogue was published on 18th April 1863, Zeller's Monograph Chil. and Cramb. not until July 1863. Walker's name has therefore precedence and this insect must be known as *Scirpophaga xanthogastrella*, Wlk. (*auriflua*, Z.).

70. Synonymy of "*Polyocha saccharella*."

Sir George Hampson has shown (*Bombay Journ.* XXI, 1251) that this insect, described by Dudgeon from specimens bred from sugarcane at Durogah in Bihar, is identical with No. 4312 of the "Fauna of India" List of Moths, *Polyocha depressella*, Swinh., and differs in neural structure from *Polyocha*.

In the *Review of Applied Entomology*, Series A, Vol. III, p. 145, this moth is referred to as *Papua depressella*, Swinh., and this name may therefore be used. The genus *Papua* was established in 1889 by Ragonot (*Bull. Soc. Ent. France* (6) IX, p. ccxx) for *latilimbella*, Rag., from New Guinea.

71. *Leucinodes orbonalis* boring Potato plants.

Specimens of *Leucinodes orbonalis*, Gn., were reared at Poona in August 1913 from larvæ boring topshoots of Potato. This moth is a well-known pest of Brinjal (*Solanum melongena*) boring in the shoots and fruits, and has also been bred from *Solanum xanthocarpum*, but its occurrence in Potato (*Solanum tuberosum*) is quite exceptional.

72. Synonymy of "*Pachyzancla aegrotalis*."

The name *bipunctalis*, Fab. (*Ent. Syst.* III, ii. 227) has precedence over *aegrotalis*, Zell., and should be used.

73. A new Synonym of *Platyptilia pusillidactyla*, Wlk.

Mr. Busck has recently redescribed specimens of *Platyptilia pusillidactyla*, Wlk., from Hawaii under the name *Platyptilia lantana* (*Insect. Menstr.* II. 103-104; July 1914). Specimens received from Mr. Swezey, of Honolulu, leave no doubt regarding the identity, and the name *lantana*, Busck, must therefore sink as a synonym.

This moth is common throughout India, Burma and Ceylon and is referred to and figured in *South Indian Insects*, page 444.

74. *Meridarchis scyroides* in Ber Fruits.

Meridarchis scyroides, Meyr. MS., was reared at Coimbatore in February 1913 from larvæ found boring into fruits of Ber (*Zizyphus jujuba*), and was also bred from Ber fruit at Pusa in March and April 1915.

75. Larva of *Argyroploce erotias*, Meyr.

This Eucosmid moth has been reared at Pusa from larvæ found feeding on tender Mango leaves in March 1912. The larva is about 16 mm. long by 2 mm. broad, slightly flattened and tapering towards the extremities, in colour uniform green, the skin soft and segments distinct; head flattened, greyish yellow, smaller than prothorax which is entirely covered by a shield darker than the head; all legs present and equally developed. The larva rolls up the tender leaves of young Mango-shoots by means of white silk threads, living in hiding and biting holes in the rolled leaves. When full-fed, it pupates in a cocoon formed of rolled leaf lined with white silk; the pupa is protruded to some extent before emergence of the moth. We also have specimens reared in October 1905 from larvæ boring mango shoots in Bombay.

76. A new pest of Arhar.

Moths reared from pods of Arhar (Tur, Red Gram; *Cajanus indicus*) at Pusa in April and May 1914 have been determined by Mr. Meyrick as *Laspeyresia trichocrossa*, Meyr. MS.

The larvæ were found in March, boring the pods and eating the seeds. As a rule the larva pupates inside the pod, having first prepared a hole of exit for the moth, this hole being covered with silk and frass. The pupa wriggles out through this hole and protrudes for half its length outside the pod before the moth bursts out of the pupal case. In some cases, the larva may pupate outside of the pod in a cocoon formed by rolling up a few dry petals. After forming the pupal chamber the larva seems to remain in a resting state for some three weeks before pupating, the moth emerging after another three or four weeks.

77. New Foodplant of *Phthorimaea operculella*.

Specimens of pupæ received from Dharwar Farm on 21st November 1912 as reared from larvæ mining leaves of Brinjal (*Solanum melongena*) produced moths which have been identified as *Phthorimaea operculella*, Z., and this identification has been confirmed by Mr. Meyrick. So far as is known, this is quite a new foodplant in India for this destructive pest which has hitherto confined its attentions to potato. In America

and South Africa it is of course well known as a destructive miner in tobacco leaves but has not been noted to attack tobacco in India.

78. *Anarsia melanoplecta* boring Mango-shoots.

The Gelechiad moth *Anarsia melanoplecta*, Meyr., was reared at Pusa in March 1912 from a larva found boring the top-shoot of a young mango twig, and covering the affected part with black pellets of frass held in place on a webbing of white silk. The larva is about 8 mm. long by 1 mm. in breadth, cylindrical, the segments well defined, in colour yellow with a pinkish tinge, the anal segment darker. The head and prothorax slightly smaller than the metathorax which is the broadest part of the body. The head is shining black, the prothorax dark-grey with a prominent black shiny shield divided medially by a fine line. Five pairs of equally developed prolegs are present.

In confinement the larva pupated in a cocoon spun amongst small twigs on the bottom of the cage, the moth emerging a fortnight later.

79. Gelechiad Pests of Stored Rice.

The small moths commonly found in stored rice are usually lumped together under the name *Sitotroga cerealella*, Oliv., but it may be useful to draw attention to the fact that *Epithestis studiosa*, Meyr., and *Aristotelia austeropa*, Meyr., have also been reared from stored rice in India. All are very similar in general appearance and colour and are best distinguished by the structural differences characteristic of the different genera; in this way they may easily be separated by the following artificial key :—

- | | | |
|---|-------------------------------------|------------------------|
| 1 | { Hindwing veins 3 and 4 connate . | . <i>Epithestis</i> . |
| | { Hindwing, veins 3 and 4 remote . | . 2 |
| 2 | { Hindwing, veins 6 and 7 stalked . | . <i>Sitotroga</i> . |
| | { Hindwing, veins 6 and 7 parallel | . <i>Aristotelia</i> . |

80. *Epithestis oschophora*, Meyr., was reared at Coimbatore in 1914 from Cholan stubble. The species is probably a rubbish-feeder and not a pest of Cholan.

81. Generic Name of "*Gnorimoschema heliopa*."

This little moth, which has been placed in the genus *Gnorimoschema* in *Indian Insect Life* and *South Indian Insects*, is really a *Phthorimæa* and should be removed to that genus.

82. *Chelaria spathota*, Meyr., was reared at Pusa in December 1909 from a larva found eating Mango leaves. It has also been reared from a larva found on tender Mango leaves at Koilpatti, Madras Presidency, in November 1909. It is apparently not a very common insect, however.

83. Another new minor pest of Indigo.

Anataractis plumigera, Meyr. MS., reared from pupa in stem of Indigo at Pusa, 4, May 1912, C. No. 945. The stem was swollen into a gall and evidently the larva had fed inside the stem.

84. Mango Leaf-miners.

Several small moths mine leaves of Mango. Amongst those reared at Pusa from such leaf-miners are various species of *Acrocercops*.

Acrocercops syngnumma, Meyr., was reared at Pusa in September 1907 and again in August 1908 from larvæ mining leaves of Mango. A specimen of the moth was also taken at Bankipur in October 1911.

Acrocercops cathedraea, Meyr., was reared from a Mango leaf-miner at Pusa in August 1908 and also from leaves of Chichri (*Achyranthes aspera*) at Pusa in September 1906. I also took a specimen at Rajshahi in Eastern Bengal in March 1911, and have it also from Coimbatore (at light, 31st May 1913). It may be noted here that *A. cathedraea* is the species referred to in *Indian Insect Life* (page 538) as *A. phalarotis*, an unpublished manuscript name.

Acrocercops isonoma, Meyr. MS., a single specimen reared from Mango in May 1907.

85. Camphor Leaf-miner.

In December 1909 Mr. R. D. Anstead, the Planting Expert in Southern India, forwarded two small moths reared from larvæ mining in leaves of Camphor leaves on Chundrapore Estate, Mudigere, Kador District, Mysore State, and wrote :—" In October last some Camphor leaves were sent to me attacked by a small mining caterpillar. The caterpillar was feeding in the palisade parenchyma of the leaf leaving the epidermis, which dried into a blister-like shelter over it. Patches were thus made on the leaf about $\frac{3}{4}$ inch by $\frac{1}{2}$ inch." These moths have been identified by me as *Acrocercops ordinatella*, Meyr., originally described from New South Wales and subsequently from Queensland and Ceylon. In Ceylon it was bred from a larva mining leaves of *Litsea* at Peradeniya. It is probably the " Leaf-miner of Camphor " referred to by Rutherford (*Trop. Agric.*, June 1914), whose brief description seems to fit the moth sufficiently well.

References to literature :—

Gracilaria ordinatella, Meyr., Proc. Linn. Soc. N. S. W., V. 145 (1880)⁽¹⁾.

Conopomorpha ordinatella, Meyr., l. c. XXXII. 54 (1907)⁽²⁾.

Acrocercops ordinatella, Meyr., Bombay Journal, XVIII., 816 (1908) ⁽³⁾ ; *id.*, Wytsm. Gen. Ins. fasc. 128, p. 15 (1912)⁽⁴⁾ ; *id.*, Exot. Micr. I. 285 (1914) ⁽⁵⁾.

Acrocercops sp., Rutherf., Trop. Agric. (June 1914) ⁽⁶⁾ ; *id.*, Bull. 15, Ceylon Dept. Agric. p. 7 (1914) ⁽⁷⁾.

New South Wales ^(1, 2, 4), Queensland ^(2, 4), Ceylon ^(3, 4, 5, 6), Burma ⁽⁷⁾.

86. A Litchi Leaf-miner.

Acrocercops hierocosma, Meyr., was bred in September 1907 from larvæ mining leaves of *Nephelium litchi* at Pusa.

87. Foodplants of *Acrocercops telestis*, Meyr.

Specimens of *Acrocercops telestis*, Meyr., were reared at Coimbatore in February 1913 from larvæ on *Trewia*. It has also been reared at Pusa in August 1907 from *Gmelina arborea* and in September 1913 from leaves of Jamun (*Eugenia jambolana*). Lefroy in *Indian Insect Life* (p. 538) records this species as mining leaves of *Trewia nudiflora* in Bihar.

88. A new minor pest of Red Gram in Madras.

Moths bred from larvæ rolling leaves of Red Gram (*Cajanus indicus*) at Coimbatore in November 1913 have been identified by Mr. Meyrick as *Gracilaria soyella*, van Dev., originally described from larvæ in leaves of *Soya hispida* in Java, and later recorded from Colombo and Hakgala in Ceylon, as reared from larvæ mining leaves of *Cajanus indicus* and drawing together terminal leaves of *Alygosia candollei*. All these plants are Leguminosæ and this little moth is probably more widely distributed in India. We have also reared it from *Cajanus indicus* at Pusa in February and March. References to literature are :—

Gracilaria soyella, van Deventer, Tijds. v. Ent. XLVII. 22-25 t. ii, ff 1, 1^a (1904) ; Meyr., Wytsm. Gen. Ins. pt. 128. p. 30 (1912).

Gracilaria acrotherma, Meyr., B. J. XVIII. 830 (1908).

89. *Prays citri*, Milliere.

This little moth, originally described from Southern Europe, is now known to occur in New South Wales and in the Philippines and has recently been recorded from India (North Coorg) and Ceylon (Colombo, Maskeliya and Madulsima). In Southern Europe it is well known as an injurious pest of the orange and other species of *Citrus*, the larva eating into all the flower organs and boring in the shoots, whilst in the Philippines the larva has been found to bore into the rind of Citrus fruits, making a gall so that considerable damage to the fruit may be caused. In India and Ceylon this moth has not yet been noted as doing any damage but it is quite likely to do so and attention is therefore called to its occurrence within our area.

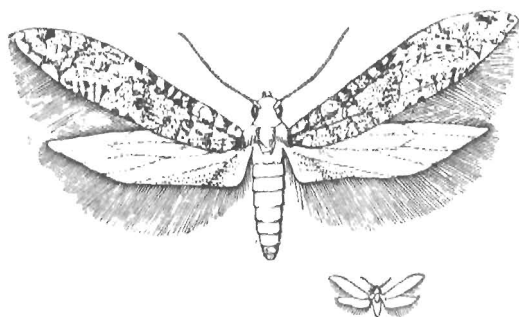


Fig. 16. *Prays citri*.
(The small outline figure shows the natural size.)

90. *Acrolepia manganeutis*, Meyr., on Stored Yam.

A series of *Acrolepia manganeutis*, Meyr., in the Indian Museum collection, was reared from larvæ and pupæ found on stored yams in Tollyganj, Calcutta, on 1st December 1911. The moths emerged between 21st December 1911 and 6th January 1912, pupation being effected within a curious net-work cocoon recalling that made by *Plutella maculipennis*. We have it also from Ootacamund (in December).

Further details regarding the occurrence of this moth are at present *desiderata*, but as it is recorded from Ceylon (Maskeliya) and the Khasi Hills it may perhaps prove of some economic interest in districts where yams are grown.

The moth is described by Mr. Meyrick in *Exotic Microlepidoptera*, Vol. I, p. 149 (December 1913).

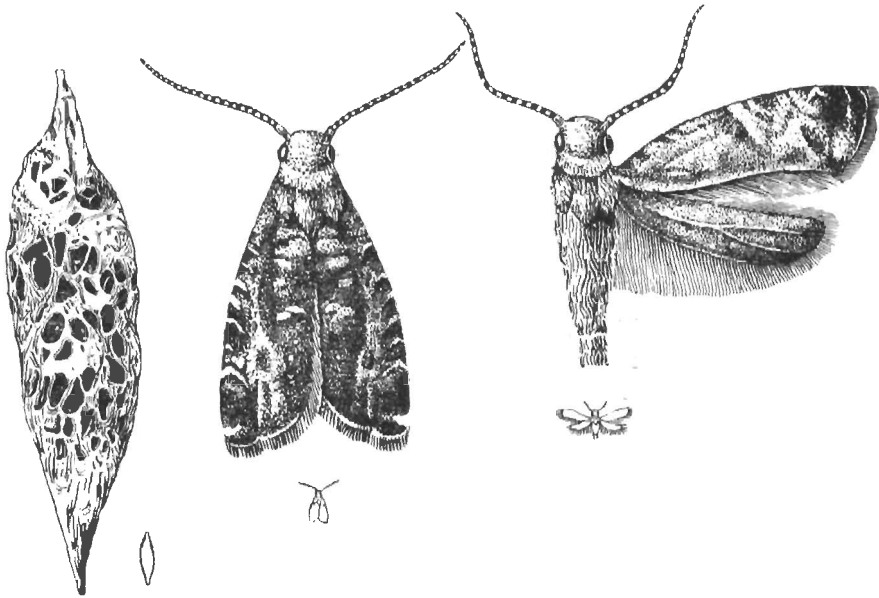


Fig. 17. *Acrolepia manganeutis*.
(The small outline figures show the natural sizes.)

91. A new minor pest of Indigo.

A small moth reared from larvæ on Indigo top-shoots at Gorakhpur and Dalsing Serai in September 1912 has been determined by Mr. Meyrick as *Pelasobathra sirina*, Meyr. (Lyonetiadæ).

The larva is about 4·5 mm. long and about 0·75 mm. across the middle of the body which tapers towards each extremity ; the segments are distinctly separated by deep constrictions ; shape flattened ; head

flat, yellow, somewhat elongate, smaller than prothorax ; colour uniform dirty white ; thoracic legs and five pairs of prolegs greyish.

The larva covers the top shoots with a profuse web of fine white silk under cover of which it lives and nibbles small portions of the leaf-surface. It is often seen to walk over the webbing. When full-fed it spins a pure-white somewhat elongated cocoon in any suitable situation which provides some corner, e.g., along the midrib on the upper surface of a leaf or in a rolled or folded leaflet. The moth emerges after about a week and rests with the anterior half of the body well raised and the antennæ held extended at right angles to the body.

92. The Indian "Clothes-moth."

The common black-and-white Indian "Clothes-moth," hitherto recorded in *Indian Museum Notes*, *Indian Insect Life*, and *South Indian Insects* under the name *Trichophaga tapetzella* is really *Trichophaga abruptella*, Well. (= *bipartella*, Rag.) which replaces *T. tapetzella* in hot countries. The true *T. tapetzella* is not known to occur in India and the necessary corrections should be made.

93. Appearance of *Croce filipennis* on the wing.

The date of appearance on the wing of *Croce filipennis* seems to be very regular. In 1910 this insect was noticed commonly at Pusa in the second week of April. In 1911 the first specimen was noted on 6th April, it was very common about 8th-15th April, then gradually decreased in numbers until the last survivor was seen about 8th May. In 1912 the earliest example was seen in the Laboratory on 1st April ; this must have been a precocious individual as no more were seen until 5th April, when they were common in bungalows and by 19th April, when I left Pusa, they were beginning to get scarce again and many dead individuals were seen lying about on windows, etc. In 1913 and 1914 I was away from Pusa in April, but in 1915 the first one was seen on 6th April in the Laboratory ; they were common about 20th April, occurring in little groups and pairing was doubtless taking place at this time although not actually noted ; a solitary straggler was seen on 25th April but by 27th April none could be found.

Although this insect is sufficiently common at Pusa there seems to be remarkably little information available regarding its occurrence elsewhere. It was described from Central India and occurs at Calcutta, appearing there a week or two earlier than at Pusa.

94. *Rhynchocoris humeralis*, Thunbg. (Distant, Fann. Ind. Rhyn. 1. 212-213, f. 133.)

Found in some numbers on orange at Myitkyina, Upper Burma, in August 1914. The insects were present in numbers sufficient to constitute a minor pest.

This species is described in the "Fauna" volume as ochraceous or greenish-ochraceous and old preserved specimens are of this colour, but in life the colour is a rich dark leaf-green, exactly the tint of the orange leaves,

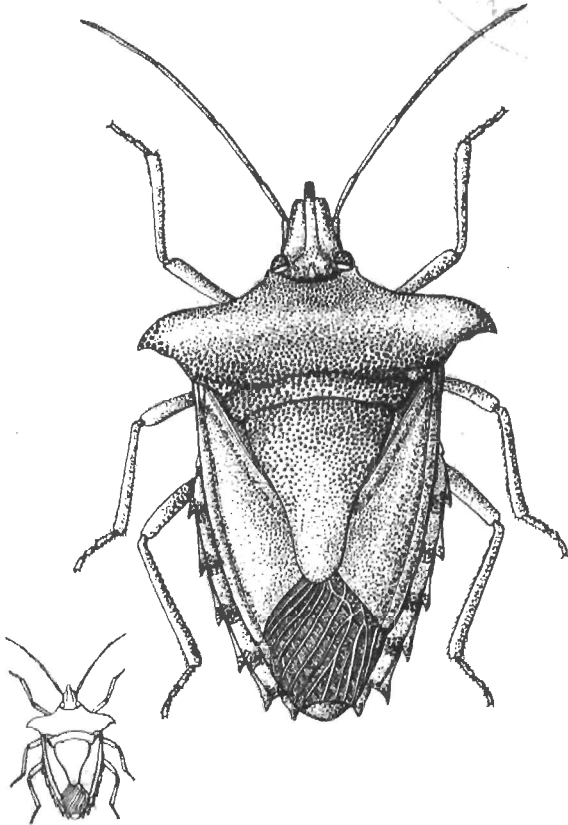


Fig. 18. *Rhynchocoris humeralis*.
(The small outline figure shows the natural size.)

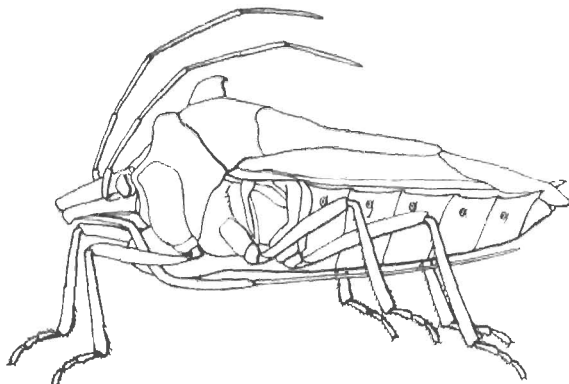


Fig. 19. *Rhynchocoris humeralis*.

95. *Rhynchocoris plagiatus*, Wlk. (Distant, Faun. Ind. Rhyn. I. 213.)

Found in considerable numbers on *Coca* (*Erythroxylon coca*) at Peradeniya, Ceylon, in April 1914, the bright green colour of the bugs approximating closely to that of the leaves of the tree on which they were resting.

† We have this insect also from Yercaud, in the Shevaroy Hills. In the present case it occurred on *Coca* at Peradeniya in sufficient numbers to constitute a pest.

96. Early stages of *Stephanitis typicus*, Dist.

The figure shows the stages in the lifehistory of *Stephanitis typicus*, the illustrations having been drawn from individuals in different stages of development but all found together at one time. So far it has not proved practicable to follow up the lifehistory in detail but the various stages are figured in sufficient detail for economic purposes.

The eggs are thrust into tissues of a leaf of the foodplant (usually Plantain) either singly or more frequently in groups. The numbers actually counted in five such groups were 23, 37, 44, 67 and 91. The opening made by the ovipositor of the female when egg-laying becomes ringed with white, whilst the cavity in which the egg is actually embedded turns black, so that the places where eggs have been deposited become readily apparent when search is made with a lens.

The young bugs and adult insects are dull whitish in colour and very inconspicuous against the whitish bloom present on the leaves of some varieties of plantain. They are rarely found on the upper surface of the leaf but feed almost exclusively on the lower surface, which they puncture especially along either side of the mid-rib, producing a spotted appearance of the leaf which presently looks unhealthy and loses the glossy appearance characteristic of healthy tissue.

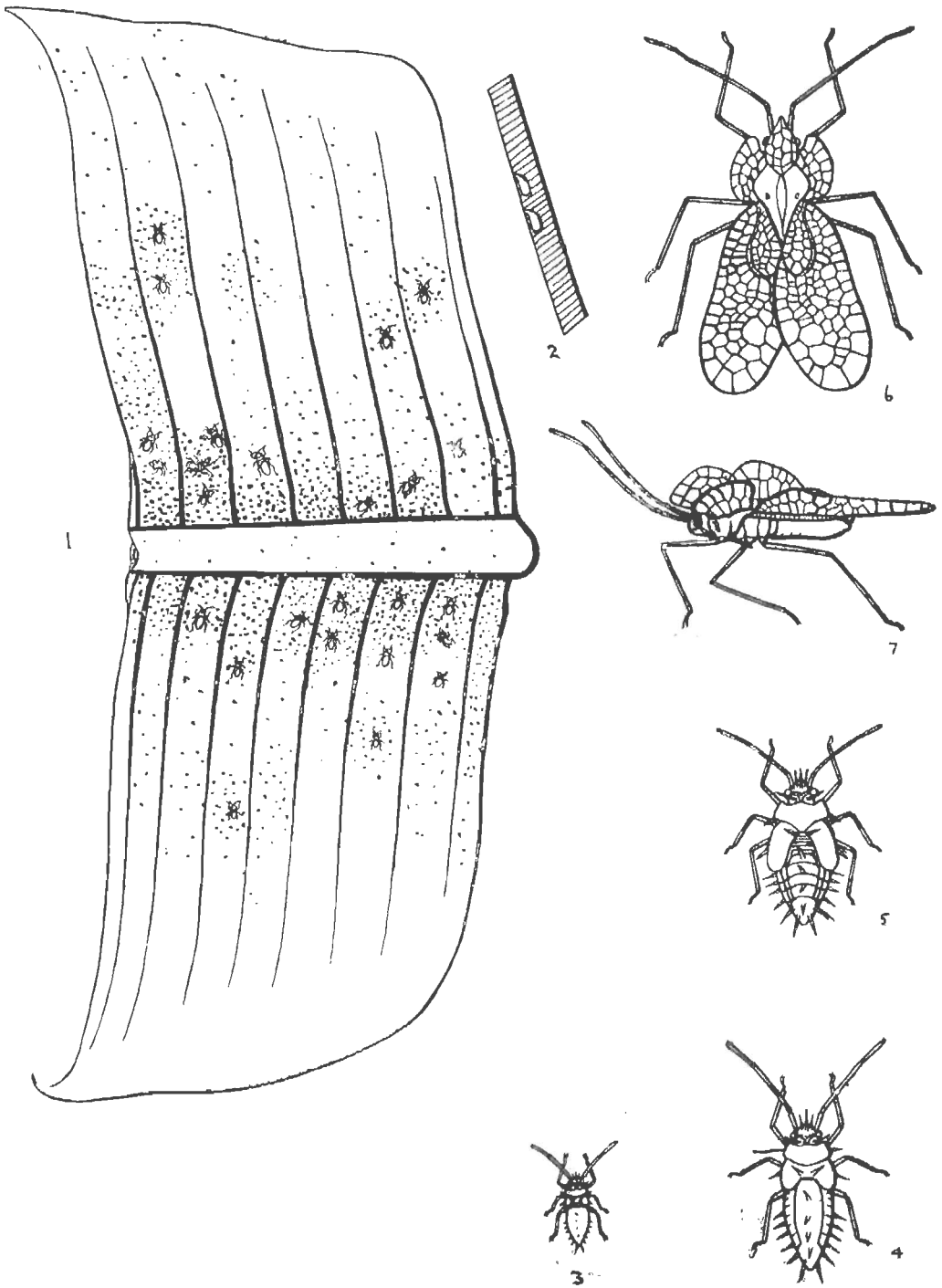


Fig. 20. *Stephanitis typicus*.
(Fig. 1 is natural size ; the other figures are magnified.)

97. Sugarcane Hoppers.

The identity of Sugarcane Hoppers in India has become greatly confused and a note on the present state of our knowledge may be useful.

In *Indian Museum Notes*, Vol. V, page 43 (1900), a hopper destructive to cane in the North Arcot District is referred to under the name of *Dictyophara pallida*; this note probably refers to *Pyrilla perpusilla* wholly or in part.

In *Indian Insect Pests*, page 134, and *Entom. Memoirs Dept. Agric. India*, Vol. I, page 240, Lefroy used the name *Dictyophara pallida* to indicate a cane-hopper which is probably really a species of *Pyrilla*.

In *Indian Insect Life*, page 727, Lefroy stated that "*Pyrilla* (*Zamila*) *aberrans*, Wlk., (*lycoides*, Wlk.) has been confused with *Dictyophara pallida*, Don., in *Indian Museum Notes* and other publications. It is an important pest to Cane (and) is found practically throughout India." The figure (Fig. 500) given here apparently represents *P. perpusilla*, and it may be noted that *aberrans*, Wlk., is a distinct species from *lycoides*, Wlk., which is Siamese and not Indian at all, unless it proves to occur in Burma.

Specimens found at Pusa have been identified by Mr. Distant as *Pyrilla aberrans*, *P. perpusilla*, and *P. pusana*, the last being a novelty described in *Ann. Mag. Nat. Hist.* (8) XIV, p. 326 (October 1914), so that we have three distinct forms of *Pyrilla*, all occurring in one locality. These three forms are extremely close to one another and not easy to discriminate and it is possible that they may be shown to intergrade. Long series of hoppers, from all the cane areas of India and taken at different seasons of the year, are required to establish the specific validity of these forms.

98. Indian Aleurodidae.

In Technical Bulletin No. 27 of the United States Bureau of Entomology, Messrs. Quaintance and Baker have lately discussed the classification of the described Aleurodidae (Aleurodidae) of the World. As the Indian species are very little known and have been greatly neglected, although some are of considerable economic importance, it may be useful to Indian workers to give a list of all species known from the Indian Region (including Ceylon), extracted from the above publication. Those species marked * are known to be of some economic interest.

* *Dialeurodes citri*, Riley and Howard. (India, China, Japan, etc. on *Citrus* and *Jasminum* spp.)

* *D. eugeniae*, Mask. (India; on *Eugenia*.)

Aleuroplatus alcocki, Peal. (Calcutta; on *Ficus indica*.)

A. hoyae Peal. (Calcutta; on *Hoya* sp.)

- A. quaintancei*, Peal. (India ; on *Ficus religiosa*.)
Pealius bengalensis, Peal. (India ; on ?)
Bemisia leakii, Peal. (India, Fiji ; on Indigo.)
B. religiosa, Peal. (India ; on *Ficus*.)
Aleyrodes cotesii, Mask. (Baluchistan ; on Rose.)
Aleurocanthus bambusæ, Peal. (India ; on bamboo.)
 * *A. nubilans*, Buckt. (India ; on betel leaves (*Piper betle*).)
 * *A. piperis*, Mask. (Ceylon ; on pepper.)
 * *A. spiniferus*, Quaint. (India, Java ; on *Citrus*.)
 * *Neomaskellia bergi*, Sign. (India, Java, Philippines, Mauritius, etc., on cane.)
 * *Aleurolobus barodensis*, Mask. (India ; on cane.)
A. simula, Peal. (India ; on *Bombax malabaricum*.)
Asterochiton vaporariorum, West. (India ; cosmopolitan.)
 Specimens of all species are required at Pusa in order to obtain further information concerning distribution and range of foodplants of these insects in India.

99. Food of *Liogryllus bimaculatus*.

In *South Indian Insects* (page 537) I have noted as regards the food of *Liogryllus bimaculatus*, the large black yellow-spotted cricket, that it "probably feeds on decaying vegetation ; possibly predaceous on other insects." In March 1915 specimens were collected at Pusa in a gram-field infested with larvæ of *Agrotis ypsilon* and it was found that in confinement these crickets fed on both ripe gram-pods, climbing up the plants and biting a hole through the capsule and eating the seeds, and on living larvæ of *Agrotis ypsilon*. They seemed to prefer a mixed diet, eating both gram-pods and larvæ when both were provided.

100. *Coptotermes gestroi* in India.

Coptotermes gestroi was originally described by Wasmann from Burma. The Pusa collection contains specimens, identified by Professor N. Holmgren as *C. gestroi*, from Assam.

Coptotermes gestroi has earned an unenviable notoriety in economic literature as destructive to Rubber-trees in the Malay Peninsula, but it is probable that the Malayan species is *Coptotermes curvignathus*, Holmgr. (Termitenstudien IV 77) which is the *gestroi* of Haviland and Bugnion but not of Wasmann. *C. curvignathus*, Holmgr., is known from the Malay Peninsula, Singapore, Borneo and Burma.

PUSA,
September, 1915.

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